



Robustness of modelled Carbon-Water Relations in C-TESSSEL

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The Natural Carbon Observatory of the GEOLAND integrated project aims at producing a pre-operational global carbon accounting system with a description of natural carbon fluxes and stocks that are fully consistent with soil water content and water vapour fluxes. To this end, an offline version of the Tiled ECMWF Surface Scheme for Exchange over Land was extended to describe the coupled fluxes of CO₂ and water vapour with a dynamically varying Leaf Area Index (C-TESSSEL). The effect of drought on the carbon fluxes was incorporated following the developments in the surface scheme of Météo-France, ISBA-A-gs. In this study, the new carbon routine of C-TESSSEL is validated using *in-situ* data from micrometeorological observations. Special care is taken to select truly independent data sets, and data for different biomes, in different climate zones. The year 2003 is chosen to validate C-TESSSEL because the severe drought conditions in Europe during that year present an excellent opportunity to test the robustness of the model and to further analyse carbon-water relations under such extreme conditions. A major focus of the present validation study and subsequent analysis is the behaviour of Water Use Efficiency (WUE) because 1) it is a crucial parameter in studies of the coupling between the hydrological and carbon cycle; 2) in contrast to non-normalized quantities WUE allows a fair validation of the dynamics in the carbon routine. Modelled and observed differences in WUE between locations and under extremely dry conditions are examined. Rather than comparing fluxes directly, functional relationships derived from model and observations will be compared so that important controls of water-carbon relations may be revealed. This allows an assessment of the extent to which C-TESSSEL adequately represents such controls.